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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/898,043	07/05/2001	Nobuhiko Hayashi	010849	2566

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EXAMINER	
MONDT, JOHANNES P	

ART UNIT	PAPER NUMBER
2826	

DATE MAILED: 01/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/898,043	HAYASHI	
	Examiner	Art Unit	MW
	Johannes P Mondt	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *25-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *25-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *10/14/4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 01/02/2004 has been entered.

Response to Amendment

Amendment field 01/02/2004 with aforementioned Request for Continued Examination forms the basis of this office action.

In said Amendment Applicant amended claim 25 (on which all pending claims depend) and claim 37. Claims 1-24 had previously been cancelled. Claims 25-37 are in the application.

Comments on Remarks appended to said Amendment are included below under "Response to Arguments".

Information Disclosure Statement

The examiner has considered the items listed in the Information Disclosure Statement filed 01/02/2004; cf. signed copy of Form PTO-1449 herewith enclosed.

Claim Objections

2. *Claim 29* is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim, or amend the claim to place the claim in proper dependent form, or rewrite the claim in independent form.

In particular, claim 29 depends on claim 25. Said ridged portion in claim 25 is the ridge portion of said cladding layer of first conduction type. If the further limitation as defined by claim 29 were false, then said ridge portion would have a thickness not less than 0.3 μm. Therefore, said cladding layer would also have a thickness not less than 0.3 μm. Therefore, its maximum thickness would also be not less than 0.3 μm, in contradiction with the final limitation of claim 25.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. ***Claims 25, 27-34 and 36-37*** are rejected under 35 U.S.C. 102(e) as being anticipated by Nagahama et al (6,172,382 B1).

Nagahama et al teach a nitride based semiconductor laser device comprising (cf. fourth embodiment, Figure 9):

a light emitting layer 314/315/316/317 (cf. col. 36, l. 10-16, l. 18-28, l. 30-38 and l. 40-46), composed of a Group III nitride based semiconductor (InGaN) (cf. col. 36, l. 18 – 28) and including an active layer 315 (loc. cit.); and

a cladding layer 318 (cf. col. 36, l. 47-52) of a first conduction type (p-type) composed of a Group III nitride based semiconductor (cf. col. 36, l. 47-53), formed on said light emitting layer, having a larger band gap (cf. col. 12, l. 53-59 and col. 36, l. 47-52: note that the comment in column 12 on a higher band gap for the p-type cladding layer when the latter functions as carrier trapping layer also applies to the fourth embodiment as evident from the cited portion of column 36 on the material constitution of said p-type cladding layer) and lower refractive index (cf. col. 38, l. 10-38), said cladding layer of a first conduction type has a ridge portion (cf. col. 34, l. 40-45 and Figure 9), and the maximum thickness (i.e., maximized over location) of said cladding layer of a first conduction type being less than 0.3 μm, because the range for the thickness of said cladding layer of the first conduction type 318 is 50 Å - 1 μm (cf. col. 40, l. 15-31) and hence substantially overlaps with the claimed range of 0 – 0.3 μm.

In conclusion, Nagahama et al anticipate claim 25.

On claim 27: Nagahama et al teach that said light-emitting layer further includes an optical guide layer 317 (cf. col. 36, l. 40-45) and that said optical guide layer may be a GaN layer (cf. col. 36, l. 40-45). In view of the constitutions of the materials of the active layer (InGaN), optical guide layer (GaN) and the p-cladding layer (AlGaN) and the ordering of the dielectric constants, $2.15 \approx \varepsilon_{AlN} < \varepsilon_{GaN} \approx 2.6 < \varepsilon_{InN} \approx 2.9$ (cf. for instance Rumyantsev et al, "Properties of Advanced Semiconductor Materials: GaN, AlN, InN, BN, SiC, SiGe", M. Levinstheyn et al, particularly, pp. 16 (GaN), 39 (AlN) and 58 (InN)) and the near-linearity for small values of the stoichiometric parameter the refractive index (= square root of said dielectric constant) of said optical guide layer is higher than that of the cladding layer and lower than that of the active layer. Furthermore, in view of the expressions $E(Al_xGa_{1-x}N)=x*E(AlN)+(1-x)*E(GaN)+b*x*(1-x)$ and $E(In_x Ga_{1-x} N) = x*E(InN) + (1-x)* E(GaN) + b*x*(1-x)$ and the values E(InN) = 1.95 eV, E(GaN)=3.40 eV and E(AlN)=6.20 eV (cf. S. Nakamura et al, "The Blue Laser Diode", Springer Verlag (Berlin, Heidelberg, New York), Second and Enlarged Edition (2000), ISBN: 3-540-66505-6, pp. 161-162 and: "Introduction to Nitride Semiconductor Blue Laser Diodes and Light Emitting Diodes", Editor: S. Nakamura; Taylor and Francis (New York), p. 357 (2000)) said optical guide layer of first conduction type has a smaller band gap than said cladding layer of first conduction type and a higher band gap than said active layer. Finally, said cladding layer of first conduction type is formed on said optical guide layer of first conduction type.

On claim 28: Nagahama et al further teach that said light-emitting layer further includes a carrier leakage prevention layer 316 (cf. col. 36, l. 30-38) of first conduction type (p-type) formed on said active layer (cf. Figure 9) and having a larger band gap than said optical guide layer of first conduction type (cf. col. 36, l. 40-41); and said optical guide layer of first conduction type is formed on said carrier leakage prevention layer of first conduction type (cf. Figure 9).

On claim 29: the thickness of said ridge portion in Nagahama et al is less than 0.3 μm (cf. discussion of claim 25, which claim 29 fails to further limit: see claim objection above).

On claim 30: in Nagahama et al said Group III nitride based semiconductor contains gallium, aluminum and indium (cf. col. 35, l. 20 – col. 37, l. 35).

On claim 31: in Nagahama et al said cladding layer 318 of first conduction type contains gallium and aluminum (cf. col. 36, l. 47-52).

On claim 32: in Nagahama et al said active layer 315 contains gallium and indium (cf. col. 36, l. 18-28).

On claim 33: in Nagahama et al said active layer has a multi-quantum well structure alternately including one or more well layers and a plurality of barrier layers (cf. col. 36, l. 18-28), and inherently by virtue of the constitution of wells alternating with barriers the band gap of said active layer is the band gap of said one or more well layers.

On claim 34: it is understood in the art of semiconductor laser devices that the electric field distribution of laser light in the active layer is changed, i.e., has a time dependence, in accordance with a sine or cosine function because coherent light is activated within said active layer; and that the electric field of laser light in the cladding layer of a first conduction type is changed in accordance with an exponential function, as light is not activated but instead partly absorbed in said cladding layer. Therefore, the further limitation of claim 34 does not distinguish over the prior art.

On claim 36: said first conduction type in Nagahama et al is p-type (cf. discussion of claim 25 and col. 36, l. 47).

On claim 37: the nitride based semiconductor laser device by Nagahama et al further comprises a cladding layer 313 (cf. col. 35, l. 60 – col. 36, l. 8) of second conduction type (n-type) composed of a Group III nitride based semiconductor (cf. col. 35, l. 60 – col. 36, l. 8), wherein said light emitting layer is formed on said cladding layer of second conduction type (cf. Figure 9).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. ***Claim 26*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Nagahama et al (6,172,382 B1) in view of Okumura et al (WO98/39827). The national stage Okumura (6,377,597) is used as translation. As detailed above, Nagahama et al anticipate claim 25. Although Nagahama et al recite a value of 0.08 for the aluminum composition ratio of said cladding layer of first conduction type in the aforementioned fourth embodiment (cf. col. 36, l. 47-54), Nagahama et al do not necessarily teach the further limitation as defined by claim 26 and any teaching or suggestion to lower the aluminum composition ratio appears absent.

However, in a closely related Group III nitride semiconductor laser device with ridge portion and with an active layer comprising InGaN and with cladding layers comprising $Al_xGa_{1-x}N$ (hence certainly related art) Okumura teaches inter alia that a lowering of said aluminum composition ratio downward from x=0.10 may be used (cf. col. 6, l. 36-55) has the advantage of decreasing the resistance of the semiconductor laser device (cf. col. 6, l. 45-50).

Furthermore, Applicant, in the Specification, does not disclose why the difference between an aluminum composition ratio of not more than 0.05 as claimed and of about or substantially less than 0.1 as taught by Nagahama et al and Okumura, respectively, is critical to the invention. In view of the absence of a teaching why a range is critical to the invention in comparison with the range found in the prior art Applicant is reminded that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. Furthermore, as mentioned above, a motivation to decrease the said aluminum content is taught by the prior art as cited.

7. ***Claim 35*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Nagahama et al (6,172,382 B1) in view of Tanaka et al (4,961,197) (the latter previously made of record). Nagahama et al do not necessarily disclose the further limitation as defined by claim 35. However, the use of current blocking layers in the art of nitride based semiconductor laser devices for the specific purpose (*motivation*) to improve light emitting efficiency has long been known, as evidenced by Tanaka et al, who teach (cf. Figure 1) the nitride based semiconductor laser device to comprise a current blocking layer (cf. column 12, line 60 – column 13, line 28) formed on the upper cladding layer 5 (cf. column 12, line 60 – column 13, line 40) and having a striped opening (cf. column 12, line 60 – column 13, line 40). Combination of the teaching by Tanaka et al with the invention by Nagahama et al presents no difficulties as the layer by Tanaka et al can be standardly produced.

Response to Arguments

8. Applicant's arguments filed 01/02/2004 appended to an Amendment have been fully considered but they are not persuasive. Said Amendment substantially altered the claim language of all outstanding claims, which have been rejected above upon first examination. Applicant's arguments on thickness have thus been rendered moot.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is: 703-306-0531 BEFORE February 4, 2004; and 571-272-1919 AFTER February 4, 2004. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 703-308-6601 BEFORE February 4, 2004, and on 571-272-1915 AFTER February 4, 2004. The fax phone number for the organization where this application or proceeding is assigned is 703-308-5399.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

JPM
January 17, 2004